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ABSTRACT

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COMPETENCY-BASED VOCATIONAL EDUCATION:

A REVIEW

written by

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FOREWORD

The Educational Resources Information Center on Career Education (ERIC/CE) is one of sixteen clearinghouses in a nationwide information system that is funded by the National Institute of Education. The scope of work for ERIC/CE includes the fields of adult-continuing, career, and vocational-technical education. One of the functions of the Clearinghouse is to interpret the literature that is related to each of these fields. This paper should be of particular interest to vocational education teachers, administrators, teacher educators, and curriculum developers.

The profession is indebted to William C. Knaak for his scholarship in the preparation of this paper. Recognition is also due Tracy C. Harrington, Florida State University, and Glen Fardig, The Center for Vocational Education, for their critical review of the manuscript prior to its final revision and publication. Wesley E. Budke, Vocational-Technical Specialist at the ERIC Clearinghouse on Career Education, supervised the publication's development. Madelon Plaisted and Jo-Ann Cherry coordinated the production of the paper for final publication.

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A review of the literature base on competency-based education (CBE) as it relates to vocational education (competency-based vocational education or CBVE) is presented in this information analysis paper. The following topics are discussed: differences between traditional and competency-based education; growth and breadth of CBVE (including discussion of professional teacher education, professional education, college and university CBE courses, state boards and state departments of education, vocational-technical institutes and community colleges, the military, industry, and other countries): critical components in the specification of learner objectives (including discussion of determining which competencies to teach, criterion or standard to be attained, assumptions about aptitudes of learners, and rhetoric and consistency of model); providing instruction; assessing the learning experience; and priorities for research. The author recommends (1) that vocational educators recognize the interrelatedness of CBVE, mastery learning, and individualized instruction, and develop instructional programs, learning materials, and progress reporting systems that embody all three concepts, (2) that the writing of performance criterion be standardized around three components: a statement of visible performance or behavior required, a statement of the conditions under which mastery will be attained, and a description of the standard or criterion to be reached, and (3) that a dictionary of common definitions for CBVE be developed. (TA)

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INTRODUCTION

HISTORICAL PERSPECTIVE

Very few educational concepts in recent years have had as great an impact on educators and on society as competency-based education (CBE). According to Walker (1977), "Competency-based education is shaping up as the next major reform movement in American education." While this paper will be based primarily on competency-based vocational education (CBVE), the relationship between CBE and CBVE is so integral that some preliminary discussion about CBE is a necessity.

First applied to teacher education in 1968, CBE has since spread to many other segments of education and training throughout the country and, indeed, the world.

DIFFERENCES BETWEEN TRADITIONAL AND COMPETENCY-BASED EDUCATION

Competency-based education differs from traditional education primarily in that CBE prespecifies the standard of attainment expected of the student before instruction takes place.

In traditional systems of instruction, the procedure usually takes the following format:

1. A determination is made about a subject or skill that a group of students should learn.

2. Instruction on that subject or skill is presented to the group of students, usually in the form of lectures, demonstrations, audiovisual presentations, or readings. Instruction and learning time is usually the same for all students unless it is a reading assignment, which students can perform outside of class.

3. Finally, a test is given to all the students. They are usually graded A, B, C, D or F according to how their test score deviates from the norm (average score). An individual student's grade is usually based on comparison of his/her score with the scores of the other students. This is known as norm-referenced testing. The level of achievement required for an A or B grade is often not known to the student before the test results are available. About 25 percent (As and Bs) can ordinarily be regarded as having achieved "mastery" of the content under this system. The remaining 75 percent have achieved less than mastery and may not have learned critical knowledge or skills necessary for success in the next unit of learning.

In competency-based education, the format is somewhat different:

1. A determination is made about the information or skill that needs to be learned.

2. The standards or criteria of achievement is in the form of stated behavior through which a student can demonstrate that he/she has learned the content of the instruction. These criteria are provided before instruction begins.

3. Instruction initially may be group-centered, as previously described, or it may be a series of individualized learning activities.

4. When a student feels ready to be tested on the content of the instruction, he/she may take the test. The test may be a written test on the information presented, or it may be a performance test, evaluated by an observer with a performance checklist. In CBE it is not necessary for all students to take the test at the same time because the test is criterion-referenced. This means that the mastery or passing level is prespecified so that one student's grade is not compared to any other in determining results.

5. If the student passes the test(s) at the prespecified mastery level or above, he/she goes on to the next unit of instruction. However, unlike traditional instruction, CBE students who do not meet the established criteria level must return to study and/or practice the content of the first unit of instruction until they can pass at the prestated criteria level. At this point, alternative and individualized methods of presenting instruction become critical to the success of the student with less aptitude for learning this

particular unit of instruction. Experiments reported by Block (1971) and Bloom (1976) indicate that, with added time and good learning conditions, 75 percent-95 percent of students can learn most instructional content. This compares favorably with the 25 percent achieving the criteria level in traditional instruction.

POWERFUL IDEAS

In brief, the concepts of competency-based education, performance-based education, individualized instruction, and mastery learning represent powerful ideas that are beginning to shape educational views and practices. Vocational education's unique adaptation to many of these ideas is the subject of this paper.

STATEMENT OF THE PROBLEM AND DEFINITIONS

LITERATURE REVIEW

If competency-based education (CBE) and its related concepts (i.e., mastery learning and individualized instruction) are included with competency-based vocational education (CBVE) in a literature review, the task becomes monumental. The reference list quickly grows into the tens of thousands. However, it is unwise to ignore CBE in educational sectors away from vocational education because of the interrelatedness of the CBE-CBVE movement. Therefore, only a general perusal of CBE literature outside CBVE was conducted, with an effort made to identify significant CBE activities in a wide variety of settings.

CBVE literature since 1970 was pursued to the degree possible. Bibliographic information available from the ERIC Clearinghouse on Career Education at the Center for Vocational Education, The Ohio State University, and the information system provided with it were invaluable in gaining access to studies and materials not found in the more traditional library reference systems.

CBVE literature is abundant, much of it repetitive. For example, there are many articles in periodicals describing the writing of objectives in a specific office occupations program with neither the

process nor the results clarified. Hence, no effort was made to report on all of the literature reviewed. Rather, an attempt was made to address studies, reports, and articles that were either typical of several or unique.

PROBLEM(S) IDENTIFIED

In the review of CBE-CBVE literature, I found a lack of commonality among authors in use of expressions and terms associated with CBE and CBVE. This increased the difficulty of conducting research in the field and of meaningful reporting.

The diversity in use of expressions about CBE-CBVE results from two factors. First, CBE-CBVE has grown very rapidly in the 1970s in a host of different types of educational institutions and agencies. Second, there is no broad acceptance of any method of defining the components of CBVE.

THE GROWTH AND BREADTH OF CBE-CBVE

The following are among the many educational sectors whose institutions and professionals have ventured into CBE-CBVE:

1. Professional teacher education.
2. Professional education.
3. College and university courses.
4. State boards and state departments of education, and the elementary, secondary, and postsecondary schools associated with them.
5. Postsecondary technical institutes and community colleges.
6. The military.
7. Private business and industry.

Professional Teacher Education. CBE surveys were conducted through the auspices of the American Association of Colleges for Teacher Education in 1972, 1973, and 1975. In 1975, Westbrook and Sandefur (1975) surveyed member institutions in AACTE to determine the extent to which

they were involved in competency-based teacher education (CBTE). Of the 865 AACT members, 570 (66 percent) returned the survey. Of these, 288 institutions (52 percent) indicated they were operating CBTE programs. This compared with 17 percent operating CBTE programs in 1972. Only 17 percent were not involved in CBTE programs in 1975 as compared with 29 percent three years earlier. While ten institutions reported full-scale CBTE programs in 1972, forty-seven did so in 1975. Westbrook and Sandefur (1975) concluded that "(1) Institutions are continuing to move toward some CBTE model, and (2) areas most frequently involved by CBTE institutions are elementary education, secondary education, special education, and educational psychology."

An annotated bibliography on competency-based vocational teacher education identified 331 entries by Clark (1974), indicating interest in CBVTE is paralleling that in CBTE.

The Center for Vocational Education at The Ohio State University has identified and validated 384 professional competencies needed by vocational technical teachers in all the traditional vocational review areas at all levels, and has developed over 100 modules for group or individualized instruction to facilitate mastery of these competencies. According to Andreyha (1976), Florida State University (and others) has participated in the advanced testing of the modules.

Other states that have reported work in the implementation of competency-based vocational teacher education (CBVTE) include Minnesota (1975), Maine (1976), Nebraska (1975), Illinois (1975), Florida (1975), Wisconsin (1974), Georgia (1974), Michigan (1974), New York (1973), and Mississippi (1972).

The reasons for the growth of competency-based teacher education are not entirely clear. However, Anderson (1973) suggests a relationship with accountability: "The increased emphasis on accountability has been paralleled by the increased use of systems approaches in designing teacher education programs. Although it is difficult to identify precisely the factors that explain this movement, it is clear that increased costs of funding quality educational experiences require improved effectiveness and efficiency in teacher education."

Professional Education. Among CBE professional programs are The University of Texas Dental School, Antioch School of Law in Washington, D.C., the College of Human Services in New York City, and the doctoral program in management at Case Western Reserve. Alverno College in Milwaukee has established a competency-based liberal arts degree.

College and University CBE Courses. Georgetown University in Washington, D. C., has established a "Center for Personalized Instruction" and publishes a quarterly journal, "The Journal For Personalized Instruction," and a newsletter. The University also sponsors an annual conference on personalized instruction. An examination of the continuing annual reports of these conferences finds the variety and number of college and university courses being taught in a competency-based personalized method growing annually.

Houston and Warner (1977) explored the extensiveness of the CBE movement in higher education. They reported that, in 1971, Schmeider (1974) listed twenty-two items on the subject in his first bibliography and 800 items three years later. By 1976, Cappuzzello (1976) had identified over 6,000 items.

State Boards and State Departments of Education. Pittman (1975) found that during the past five years every state has studied CBE/Competency-Based Certification. Twenty-three states have produced documents which specifically address either competency-based education or competency-based certification.

In addition to the political intervention of legislators and governors, various citizen interest groups have picked up the concept of CBE. It is being advocated by "back-to-basics" groups as a way to assure minimum achievement levels for high school graduates.

Oregon and California are among the states that have legislated exit competencies for high school diplomas.

Vocational-Technical Institutes and Community Colleges. The concept of competency-based education has been entering the field of vocational-technical education in a variety of ways. Some postsecondary vocational-technical institutes have developed and are operating complete institutional systems of competency-based, self-paced personalized instruction. Among these are the Central Nebraska Technical College at Hastings, Nebraska; Fox Valley Technical Institute in Appleton, Wisconsin; 916 Area Vo-Tech Institute in White Bear Lake, Minnesota; and the Suburban Hennepin Vocational Centers in Edina, Minnesota.

Other vocational training institutes are experimenting with individual CBVE programs with a traditional instructional setting.

The Military. In 1973, then-Secretary of Defense James Schlesinger noted that military training expenditures exceeded $6 billion annually and involved no less than one-sixth of all military personnel at any given time. Recognizing the Defense Department's heavy investment in manpower, Schlesinger convened a Task Force on Training Technology and gave it the responsibility of evaluating the effectiveness of Department of Defense training. After a study period of a year, the Defense Science Board Task Force (1975) observed that with a relatively small investment on research and development training technology, progress had been made in promoting cost-effective training. The Task Force noted that the "services have pioneered (a) in the use of complex simulators to train personnel to operate and maintain major weapons systems, (b) in self-paced personalized systems of instruction, (c) in performance-oriented training, and (d) in managing the training of very large numbers of individuals" (emphasis supplied).

Industry. Industry has become involved in the competency-based approach for training employees. Houston and Warner (1977) found that, among major corporations, McDonald's trains restaurant managers and Shell Oil trains refinery operators by this approach.

Other Countries. Interest in competency-based education is not confined to the United States. Vocational-technical instructors from Iran and Saudi Arabia are presently in training at the 916 Vo-Tech Institute in Minnesota with the intent of transferring the competency-based vocational instruction technology back home. The Free University of Iran, to open in 1978, will be a completely competency-based university. Teachers Colleges in Israel, Saudi Arabia, and Australia are studying CBE. UNESCO sponsored a week-long training conference on CBE for its chief technical advisers. Experimental CBE projects in technical education are ongoing in Munich and in Brazil.

Summary: Growth and Breadth of CBE-CBVE. According to Spady (1977), "With more than twenty states currently considering or implementing a range of CBE schemes for their elementary and secondary schools, this uncoordinated movement is rapidly transforming into a bandwagon that promises to be the Great American Educational Fad of the 1970s" (p. 9). However, the CBE and CBVE movement is not developing along clearly defined conceptual, operational, or institutional lines.

Clark and Thompson (1976) observed that most self-respecting fads in American education over the past few decades, this CBE bandwagon cannot be accused of having put its conceptual house in order

before launching on its uncharted parade route and accumulating a vast and lively following.

Spady (1977) concludes, "Aside from universal beliefs in the desirability of school system accountability and student 'competence', the adherents and practitioners of current elementary and secondary school CBE efforts are marching (or parading) in different uniforms to different drummers playing different tunes. Basic definitions, conceptual clarity, and analysis of the organizational and social implications of various CBE approaches are badly needed'" (p. 9).

PROBLEMS OF CBVE DEFINITIONS AND TERMS

The word competent as defined in Webster's New World Dictionary relates more to an individual "answering to all requirements, and being adequate, capable, fit." Kidd and Natalicio (1972) refer to competencies as labels given to results of a comparison of a particular performance state or a process with a static performance standard of behavioral criterion. Competencies are inferences then, and each competency is only inferentially related to the learning process from which the static comparison is derived. While the second definition fits the needs of curriculum development more readily, it does seem far afield from the original derivation. This definition progression may not be unusual, but it can be confusing to someone who has not been following the process.

Howsam and Houston (1972) defined CBE in operational terms of a simple straightforward concept with the following central characteristics: (1) specification of learner objectives in behavioral terms; (2) specification of the means for determining whether performance meets the indicated criterion levels; (3) provision for one or more models of instruction pertinent to the objective, through which the learning activities may take place; (4) public sharing of the objectives, criteria, means of assessment, and alternative activities; (5) assessment of the learning experience in terms of competency criteria; and (6) placement on the learner of the accountability for meeting the criteria.

Most other attempts to define CBVE have also used an operational approach. In Florida's Department of State Manual, "Delivering Competency-Based Vocational Education" (1976), CBVE is defined as relying on these assumptions:

1. The skills and knowledges that students learn should be directly related to the duties and responsibilities they will have to perform on the job.

2. These skills and areas of knowledge, and the means for evaluating their attainment, should be specified in advance and made known to the students.

3. Students should be provided with whatever instructional experiences they need to attain the skills and knowledge required by the jobs they are aiming for.

The manual extends the operational definition by adding, "As vocational education in Florida moves to a competency-based approach, it must also move toward individualized instruction. In competency-based education, the emphasis is on attaining clear-cut, measurable competencies--not on spending two years in a course, getting a passing grade, or any of the other conventional standards for evaluating a student's progress. Since competency-based vocational education stresses helping every learner acquire the specific skills and knowledge needed on the job, and since individuals differ in how they learn, instruction must be varied to help individuals master those competencies. Varying instruction to meet individual needs is the essence of individualized instruction" (emphasis supplied).

Hirst (1977) treats performance-based and competency-based vocational education programs as equals, and goes on to identify nine components of such programs:

1. Employment opportunities for students.
2. Identifying tasks that workers perform.
3. Obtaining or developing occupational inventories.
4. Analyzing and using occupational survey data.
5. Analyzing existing materials and media.
6. Developing lesson plans.
7. Testing new materials and lesson plans.
8. Revising materials and media.
9. Revising and updating the task analysis.

Dr. Hirst's operational definition raises another question about defining CBVE. Should such a definition include only those components that are unique to CBVE as compared to traditional instruction? Or, as in Dr. Hirst's definition, should it include all components that should be a part of any viable vocational program, such as "employment opportunities for students"?

For purposes of examining the literature on CBVE, this paper will focus on those components which have particular application to CBVE.

Another question arises when writers about CBE have participated in a singular component of CBVE, such as the writing of performance objectives. They often describe their effort as <u>being</u> CBVE. But is it? Writing performance objectives is appropriate and necessary, but should not be regarded as <u>being</u> competency-based education. It is one component of CBVE. This process might be compared to an appellate court judge in New York who, when ruling on the school liability factors of snowball-throwing, stated, "The fact that fallen snow has turned to ice is not evidence that snowballs are being thrown." Similarly, the fact that performance objectives are being written is not evidence that CBVE is in progress.

In the balance of this paper we will attempt to define three broad components of CBVE. The reported literature will then be categorized under these components. The purpose of this categorization is (1) to provide a model for viewing research and literature of CBVE and (2) to explore where the emphasis is being placed in current research and teaching efforts.

The broad component areas selected are (1) specification of instructional objectives, (2) providing instruction, and (3) assessing the learning experience. The following definitions are required for this paper. Numbers after the definitions refer to the related reference list on page 18.

Affective Objectives: Objectives designed to reinforce or change human attitudes central to behavior in educational activities (values and feelings, appreciations, interests, etc. toward ideas, persons, or events). Affective objectives are usually cognitions about effective events and deal with the realm of attitudes, values, beliefs, and relationships. (9) (5)

Aptitude: Consists of a student's (a) physical condition, (b) learning abilities, (c) basic skills, (d) attitudes, (e) prerequisite knowledge, and (f) prerequisite psychomotor skills. (8)

Cognitive Objectives: Educational objectives which specify behaviors of the learner relating to perceiving, understanding, processing, or using knowledge. These objectives, together with affective, performance, and product objectives, form the basis for competency-based educational programming.

Competence: Ability, skill; fitness.

Competencies: Labels given to results of a comparison of a particular performance state of a process with a static performance standard or behavioral criterion. Competencies are inferences, then, and each competency is only inferentially related to the learning process from which the static comparison is derived. (6)

Competency: Demonstrated ability to perform to criterion at function and job levels. (3)

Competency-Based Education: (1) A system of education which places high emphasis on the specification, learning, and demonstration of those competencies which are of central importance to the effective practicing of a given profession or career. (2) A term used by some to identify the current national movement in "competency-based education and certification." The term has two outstanding advantages: (a) it encompasses all major educational constituencies and (b) it includes all the professions, e.g., education, law, medicine.

Competency-Based Learning: A summary label applied to the ongoing sequence of particular interactions that have been systematically designed to approach and finally to approximate the particular performance standards. (6)

Components: Working parts of a system, dictated by the processes required in order to achieve the purposes of a system. That is, they are the resources that interact to create processes designed to achieve the system purpose. In a teacher education program, components include instructors, instructional hardware and software, and educational facilities.

Components *(continued)* A teacher education program component is--depending upon the program structure favored--a group of related modules or a group of related module clusters which complement each other and form the basis for courses in traditional programs. (7) (1)

Condition: (part of an objective) Any and all limits or circumstances under which the student will perform the behavior stated in the objective. (4)

Cost Effectiveness: Analyses designed to measure the extent to which resources allocated to a specific objective under each of several alternatives actually contribute to accomplishing that objective, so that different ways of gaining the objective may be compared. (9)

Criterion: (In the information analysis step of evaluation) The minimum satisfactory level of students mastering specific objectives or having positive attitudes toward certain methods. This criterion is preset by the instructor before the evaluation is begun. (4)

Criterion: (part of an objective) The minimum standard that the student must meet in order to reach mastery of an objective. (4)

Criterion-Referenced Test: A test used to classify a student into mastery or nonmastery categories with regard to a specific performance objective. Behavior exhibited on the criterion-referenced test matches the behavior as stated in the performance objective (i.e., if the objective requires the student to list five terms, then on the test the student lists five terms; if the objective requires the student to hem a skirt, then on the test the student hems a skirt). (4)

Enabling Competencies: Include knowledge of subject matter, philosophic and sociological rationales, skills in attacking and solving problems, decision-making, understanding-making, understanding of oneself, and knowledge of the teaching process. (10)

Enabling Objective: An objective that identifies one thing the student must be able to know or do in order to perform the unit objective successfully. Also often called lesson-sized objective or subobjective. (4)

Evaluation: The systematic generation of statistical, descriptive, and analytical information on program (project) activities. Evaluation facilitates decision-making in a specific context within a given time frame. (9)

Expected Outcomes: Intended behavioral changes as opposed to unintended changes. When applied to human behavior, expected outcomes must be considered jointly with unexpected outcomes, both of which follow behavioral intervention. Those things which one hopes to achieve through the implementation of a system may be expressed as goals and objectives. "Goals" tend to be used for larger, generic concerns and "objectives" for more precise delineation of expectations. (9)

Feedback: The process of providing information regarding performance to the person who has performed. (4)

Feedback (evaluation): The third step in the general framework for evaluation. Here information that has been collected and analyzed is used to determine and implement changes in the course or program. (4)

Goal: A statement in broad, descriptive terms of the desire and expectations of the developer and/or consumers of an educational program. (9)

Individualized Instruction: Provides instruction for individual students on a self-paced basis with variable amounts of direct instructor assistance. Provides variable approaches to learning specific competencies which meet individual-student preferred learning styles.

Instructional activities designed to attend to expressed needs of the individual learner, taking into account each learner's accumulated knowledge, skills, and attitudes, potential and rate of learning. Programmed materials are often appropriate for individualized instruction. (8) (9)

Instructional Activities: Learning experiences available to a student to facilitate that student's mastery of an objective or set of objectives. (1)

Instructional Modules: A set of learning activities (objective, prerequisite, preassessment, instructional activities, postassessment, and remediation) to facilitate the student's acquisition and demonstration of a particular competency.

Instructional Objectives: A statement that specifies a competency a student is to acquire and demonstrate.

Instructional Strategy: Specific methods or techniques of altering or varying the learning experiences of students. (4)

Job Analysis: In goal setting, the process of identifying the various components of a particular job or occupation. This process usually includes obtaining information on the type and length of training required, the tasks and duties associated with the job, the range salary potential, the working conditions of the job, and the number and location of positions available. (4)

Job Duties: (See Job Tasks)

Job Entry Skills: The minimum number of skills that an individual must possess to obtain a given job. (4)

Job Tasks: A necessary part of a job. Although often fairly complex, they are simply stated in the job description. (8)

Learner Characteristics: Characteristics of the individual student that should be considered in designing learning experiences for that student, including such things as the abilities and interest of the learner, the learner's need for attention and human interaction, the degree of structure required by the learner, the type of media preferred, etc. (4)

Learner Control: A characteristic of media that influences the degree to which a learner can proceed at his/her own pace and sequence or the ease with which the learner can use the materials independently. (4)

Learning Experiences: Those experiences prescribed or suggested for an individual student to enable the student to achieve a particular objective or set of related objectives. (4)

Learning Package (LAP): Takes into account rationale, objectives, resources, evaluation, and a physical and emotional setting in which learning is to take place.

Mastery Learning: Proposes that almost all students can master what they are taught. Mastery learning enables 75 to 90 percent of the students to achieve the same high level as the top 25 percent under the typical group-based instructional method. (2)

Module: An instructional resource package designed to meet a single, discrete behavioral objective containing the following parts: (a) reference system to a larger structure; (b) title; (c) rationale; (d) behavioral objective; (e) prerequisites; (f) preassessment; (g) postassessment; and (h) remediation.

Norm-Referenced Assessment: An evaluation procedure that places the performance of the student on a relative scale, comparing his/her performance with that of others. (11)

Objective: An intent communicated by a statement describing a proposed change in a learner--a statement of what the learner is to be like when he/she has successfully completed a learning experience. It is a description of a pattern of behavior (performance) we want the learner to be able to demonstrate.

Open-Entry, Open-Exit: A scheduling approach that allows students to enter, leave, and reenter a vocational program at any time. Completion of a program of study is possible whenever the student is able to demonstrate competency in selected objectives. (4)

Peer Teaching: A technique in which one or more learners provide instruction for a group of learners of the same age or in the same homogeneous grouping. The learners responsible for instruction have already mastered the content and skills being taught.

Peer Tutoring: An instructional technique in which instruction is provided an individual learner by direct interaction with another learner the same age or from the same homogeneous grouping. The learner responsible for instruction has already mastered the content and skills being taught.

Performance (Part of An Objective): A clear statement of what the learner will be able to do after mastery status has been obtained. (4)

Performance-Based Teacher Education: A teacher education program where the learning outcomes and the indicators acceptable as evidence of the realization of these outcomes are specified and made public. (This type of program is sometimes used as the basis for certification of new teachers.) Learning outcomes may be evidenced at: (a) the knowledge level (the result of interacting with "protocol" materials); (b) the skill level (the result of interacting with "training" materials); (c) the output level (the result of interacting with "integrating" materials); (d) the performance level (the behavior of the teacher); (e) the consequence level (the behavior of pupils).

Performance Objective: A statement, in measurable terms, of what behavior the learner will be able to exhibit under specified conditions. Each performance objective is composed of three parts: performance, conditions, and criterion or standard. (4)

Performance Standards: The criteria in behavioral terms by which actions are judged to be effective or ineffective in meeting intended outcomes. (9)

Personalized Instruction: Instruction which is designed to meet the specific needs of learners. Education is personalized when assessment, objectives, strategies, and evaluation are planned with the learners and tailored to the learner's individual needs, level, rate, values, and choices. Although personalized learning experiences most often occur in individual or small group situations, they make take place within large groups, as long as the above criteria apply. (9) (See Individualized Instruction)

Postassessment: Measures competence in meeting the module objectives. Successful performance on a postassessment signals completion of the module.

Preassessment: Preassessment procedures are measuring processes used to determine the student's level of mastery of specified objectives prior to instruction relevant to those objectives. Tests the learner's competence in selected prerequisites and evaluates present competence in meeting the objectives of the module. (1) (5)

Prerequisite: Anything required before something else can take place. Generally used to refer either to specific skills, abilities, or other requirements needed before an occupational position can be attained or to knowledges and skills required before a specific objective can be mastered. (4)

Process Evaluation: A procedure of assessing means. Generally, evaluation calls for the measurement of performance against the standard or level specified in the objectives. Process evaluation assesses the effectiveness of the processes undertaken in achieving objectives. Most evaluation of national education programs in recent years has been of this type. (9)

Standard (Part of An Objective): See Criterion (4)

Terminal Performance Objectives: A straightforward, written statement expressed from the learner's point of view describing the exact behavior (and the conditions under which the behavior will operate) the learner is to exhibit at the end of a period of instruction.

Time-Variable Instruction: Allows students to take as much time as required to master program competencies. (8)

Tutoring: Providing one-to-one instruction for student. Suggested tutors include peers, advanced students, the instructor, and volunteers from the community knowledgeable in the field. (4)

Unit Objectives: Broad objectives, such as a V-TECS objective, usually encompassing many smaller enabling objectives. (4)

Vocational Goal: The purpose or reason for an individual's vocational training. A person's vocational goal may refer to the job he/she eventually wants to hold or to specific knowledge or skills desired. (4)

V-TECS: The Vocational-Technical Education Consortium of States, formed by a group of states and agencies to develop catalogs of performance objectives and criterion-referenced measures in occupational education. V-TECS employs a uniform procedure for developing objectives and test measures based on job task analysis techniques. Members develop catalogs and receive catalogs developed by other members of V-TECS. V-TECS is an operating unit of the Commission on Occupational Education Institutions, Southern Association of Colleges and Schools. (4)

Work Sample: A set of activities made up of performance tasks associated with a particular job, used to assess an individual's potential to perform within that job area. (4)

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SPECIFICATION OF INSTRUCTIONAL OBJECTIVES

The use of the word objective in education is almost as far removed from its original derivation as the word competency. Until the late nineteenth century the word objective was used almost exclusively as a technical military term describing a geographic location or destination, that is, the "taking" of a hill in combat. It was a physical, direct, sensory, easily observable experience. The word was subsequently adopted by industrial firms to describe tangible targets to achieve the desired profit outcomes.

B.F. Skinner was one of the early educational theorists to apply the objectives concept to educational behavior, and Benjamin Bloom (1956) attempted to help clarify the differences between the more tangible and observable objectives (psychomotor), knowing objectives (cognitive), and attitude objectives (affective).

Vocational educators, along with mathematics educators, may have found it easier to adopt the "new" behavioral objectives concept because a larger portion of their instructional content contained readily observable behavior. Vocational programs, which had previously developed standards, that is, typewriting, shorthand, etc., also were able to embrace the new concept readily. Much more has been written about CBVE by business education teachers than other vocational teachers, and their descriptions of CBVE in the literature started earlier.

FOUR CRITICAL COMPONENTS

There are four critical components in properly prepared performance objectives:

1. Determination of which competencies to be used.
2. Criterion or standard to be attained.
3. Assumption about aptitude of learners.
4. Rhetoric and consistency of model.

Competencies To Be Used. Lawson and Wentling (1974) stated, "Educators ... (are) writing instructional objectives with great emphasis on the rhetoric which attends a good objective, often paying little attention to the accurate identification of competencies upon which the objectives are based " (p. 61).

A variety of methods is described in the literature for determining which competencies should be selected. Probably the most common is use of an instructional advisory committee drawn from the occupation for which training is being planned (Pucel and Knaak, 1975). In this method, persons knowledgeable about the occupation draw up a job task list. Butler (1972) maintains that task description at the activities level can only be developed by actual on the job observation and interview. This method of selecting competencies is by no means universal. It has become increasingly more common for occupational competency lists to be shared by schools and colleges within a state, or a multistate consortium.

Hirst and Childers (1974) describe a multistate organization with a primary goal the development of catalogs of performance objectives in occupational education. A similar but more recent report on the same V-TEC project has been published by the Southern Association of Colleges and Schools (Hirst, 1975). This V-TECS effort, as it relates to vocational agriculture, was also described by Oliver and Hill (1974).

Straubel (1971) examined the competency based Air Force Training Manuals and supports adaptation for civilian vocational school curricula.

Lanhan (1972) developed an inventory of 373 educational specifications in behavioral terms that represent basic tasks performed by sixteen- to twenty-year-old office workers. Based on empirical data collected by interviews with 1,232 office employees and their supervisors from four areas of the country, the specifications were drawn from 4,565 basic tasks and 32,447 steps of task performance.

A grant from the Tennessee State Board for Vocational Education considered the subject of affective domain competence of students in vocational areas. The competencies were originally derived from vocational education publications and were verified by randomly selected employees, employers, and teachers. Their degree of commonality was validated by forty-eight state vocational directors using the Delphi technique. The conclusion of these directors was that the five major areas of vocational education--agriculture, business and office, distributive, home economics, and industrial arts--do require common affective competencies; teachers, employers, and employees with directors on what constitutes affective competencies; they appear also to agree on which are important for career success; and that affective competencies appear to provide a commonality for the five areas.

Among many who have written about the writing of objectives, Impellitteri and Finch (1971) state that the objectives should be "based on tasks, job segments, evolutions of any portion of the work load that makes up a job and is judged to be important" (p.11).

Mager and Beach (1967) recommend starting with a job description and then listing all the tasks of the job. They suggest talking with the employee and the supervisor to find out what the job is, and what it ought to be.

In the *Canadian Vocational Journal*, Adams (1974) describes the DACUM system for determining competencies. DACUM is a wall chart process which involves drawing competencies from experts, using a group dynamics structure.

The question of how to obtain goals for occupational programs in a community college was settled by one community college (Williams, 1976) by studying catalogs of forty-two other Virginia community colleges. These goals were then grouped into manpower development, skills attainment, opportunity awareness, citizenship, personal enrichment, and individual needs.

The Bureau of Business Education, California State Department of Education (1973), has prepared a program guide for office and distributive occupations. The guide contains student-oriented performance objectives and optional approaches to instruction, and provides for competency-based instruction. Competencies common to both distributive and office occupations are based on seven occupations selected through task analysis studies.

Also, many CBVE competency lists undoubtedly are still assembled by individual instructors from a variety of sources, or are "validated" by broadly based community input.

In general, the weight of the literature seems to support vocational objectives content being drawn from fairly specific job tasks of duties, either through direct observation, interview, or expert testimony. There is also a trend to sharing validated objectives as exemplified by the V-TECS structure.

Criterion or Standard To Be Attained. This component refers to establishing the "level" a student should be required to attain for "mastery" performance. There are two facets to determining the required mastery level. The first is the degree of difficulty of the cognitive content or the skills to be learned. The second is the range of tolerance of scores permitted for "mastery" certification, that is, should the performance requirement be 80 percent or 100 percent.

Pucel and Knaak (1975) suggest two procedures for determining the degree of difficulty prescribed in the standard. One is to establish the competency levels of persons who are working in the occupation

and use that level as a standard for the objective. The other way is to rely on expert opinion. Both of these procedures have inherent problems. The first method involves identifying people who are successful in the occupation and requires that they be available for assessment. The second procedure relies heavily on the judgment of one or a group of specialists. The judgments are only as good as the specialists' knowledge of a particular task. The decisions about the percentage of accuracy required for mastery usually become a matter of the expert judgment of a qualified instructor or advisory committee. For example, a student's recall of 80 percent of the parts of a carburetor might be sufficient for mastery. Reassembly of a carburetor may require 100 percent for mastery.

There is little research on the subject of the standard to be designed into vocational performance objectives.

Assumptions About Student Aptitude. The third critical component in writing performance objectives is what is to be assumed about the aptitude of the learner. What should be considered prerequisite(s) to a student's being able to understand and to learn from the objective. Pucel and Knaak (1975) identify four categories of prerequisites: physical, learning ability, basic skills, and work-related attitudes. Mager and Beach (1967) describe five prerequisite characteristics: physical, education, motivation, interests and attitudes, and biases and prejudices. Aptitude for learning as used here is defined broadly as "prior learning which will enhance or inhibit the new learning experience, maturity of the learner, learning rate of the learner, and any handicapping conditions of the learner." If open enrollment or registration in the vocational program is assumed, some basic performance objectives in arithmetic and communication skills may be required. Or, a student entry level may either exclude some students or require that students receive preprogram basic training. Exclusion may or may not be feasible, based on the philosophy and legal position of the vocational program or educational institution.

There is little research on the relationship of the learner aptitude to the development of objectives.

Rhetoric and Consistency of the Objectives Model. A fourth critical component in preparing objectives is the rhetoric and consistency of the "model" in which the performance objectives are written. Lawson and Wentling (1974) state that "An objective of this type, to be structurally sound, should incorporate an action verb, specification of the minimum standard of performance, and learning conditions associated with the respective competency" (p. 63). Pucel and Knaak (1975) suggest a similar model which includes, "the givens" (what the student will be

using to learn), "the performance" (some visible performance or result), "the standard" (a basis for measuring the learner's performance in comparison with the objective criterion).

According to Mager and Beach (1967), "It is important to describe as comprehensively as possible what a student will be like when he finishes the course" (p. 28).

Butler (1972) identifies three main reasons for preparing objectives:

1. There is a need to know exactly what the student will be expected to do as a direct result of the training.

2. There is a need to know exactly the conditions under which the student will have to perform.

3. There is a need to know exactly what the standards of performance will be. The instructional systems designer must have this information to make decisions on content, sequence, method, and media. The same information serves as the basis of the criterion tests used to assess the performance of the students and the system itself. Thus, properly stated training objectives provide the very structure upon which the entire instructional system is to be built. Their importance to the course developer is obvious, but there are others who also have a real need for explicitly stated performance objectives.

Davies (1971) writes that a useful objective--unlike an aim--should contain three types of information:

1. A statement of the performance or behavior required.

2. A statement of the conditions under which mastery will be observed.

3. A description of the standards to be reached.

If any of these ingredients are missing, then interpretation difficulties are likely, even though the missing information can sometimes be derived from context. In industrial training, a fourth type of information is often included, describing any precautions or safety procedures that might be necessary because of inherent dangers in the situation.

Alvir (1974) explores four problems that frequently occur in the development of performance-based curricula: too much data, too little systemization, too little student participation, and too little time. He suggests the following:

1. Develop objectives in writing only for essential material.

2. Write objectives in a format that is subject to continual revision and updating.

3. Assume some students can contribute to objective clarity.

4. Let student participation grow out of staff efforts.

5. Develop the curriculum slowly to balance conceptualization and operational possibilities.

Florida State University's "Delivering Competency-Based Vocational Education" (1976) describes objective writing as having three parts:

1. Performance. Gives very clear statement of exactly what the learner will be able to do after mastery status is reached.

2. Conditions. Identifies any and all limits or circumstances under which the student will perform the objective.

3. Criterion. Sets a minimum standard that the student must meet to be classified as having obtained mastery.

The Vocational Education and Career Development Service of the Michigan State Department of Education sponsored a performance objectives development project (1974). The document provides an overview, guidelines for writing performance objectives, instructions for writing a performance objectives adoption report, a sample adoption report, an action index, blank forms for use in writing and submitting objectives, and the USOE Code Extracts for writing performance objectives.

In a situation described by Huffman (1970), when secondary schools had moved into modular scheduling, programmed instruction, individualized instruction, and differentiated staffing, it was the teacher's responsibility to provide students with clear, complete, and detailed performance goals.

Johnson and Shearron (1975) have attempted a more simplified approach for writing and specifying occupational competencies to assist educators unfamiliar with what they perceive as the more complex concepts used by other authors.

In general, however, the process described by most authors (that is, Butler, Mager, and Beach, Pucel and Knaak, and Florida State University) tends to be similar to the "basics" outlined by Davies:

1. A statement of visible performance or behavior required.

2. A statement of conditions under which mastery will be observed.

3. A description of the standards to be reached.

There also appears to be a general balance of support for the use of a "hard" verb to describe the action (that is, "identify," "construct," or "write," as compared to "know," "understand," or "appreciate").

PROVIDING CBVE INSTRUCTION

Research and reports on providing instruction in a CBVE format fall into three categories:

1. There has been a massive effort to develop CBVE learning materials, often sponsored by state departments of education, but using federal funds.

2. Reports on research conducted using a competency-based system. These are limited in number.

3. Articles in periodicals where a teacher or teachers have done "something" in CBVE and have written about it. The number of articles is large and growing, and it was not possible to include a complete description in this paper. Also, many of the authors are not experienced curriculum developers, researchers, or writers, and the information provided in the articles is not complete. An effort was made to report on articles that were either typical of many, or that had unique characteristics.

MATERIALS DEVELOPMENT

Florida State University (1976), working with forty-eight vocational teachers, has produced "Delivering Competency-Based Vocational Education--A Teachers' Guide to Individualizing Instruction." This

manual encompasses:

- Seeking and setting individual vocational goals.
- Utilizing performance objectives and criterion referenced tests to individualize instruction.
- Using learning strategies to individualize learning experiences.
- Using contingency management in individualized settings.
- Evaluating and managing individualized instruction.

Available from Kentucky University is a "Handbook for the Development of Vocational Education Modules," edited by Fardig (1975). Separate sections describe the components, that is, Title, Introduction, Directions, Objectives, Series of Learning Activities, Special Learning Materials, Instruction Sheets, Student Self-Checks and an Instructors' Final Check List.

The Louisiana State Department of Education has completed competency-based curricula for nursing, electronics, drafting, air conditioning and refrigeration, home economics, and agriculture (1976).

The University of California at Los Angeles has competency-based materials in allied health programs (1974).

The Minnesota State Department of Education, Division of Vocational-Technical Education, has maintained as an ongoing project effort since 1972 the articulation of secondary-postsecondary vocational curriculums in Minnesota (1977). While the major intent was program articulation, the project activities have significance for this article because project activities were closely associated with competency-based vocational instruction. Early effort in the project focused on developing competency or task lists, and the competency records needed for competency-based instruction. A Handbook was also written for teachers to help explain how they can deliver task-based content to students. Competency-based, personalized instruction is advocated in the handbook. A regional process for articulation through the development of competency-based instruction was developed and successfully piloted in auto mechanics. Publication and inservice training materials for instructors are some of the "products" available from the project.

In a publication prepared for the American Vocational Association, Pasewark and Kilchenstein (1974) edited descriptions of twenty-five

individualized instruction programs in business and office education. The descriptions focused on the learning strategies used.

Epley and Shisler (1976) have described how Greenville Technical College's Educational Development Team (EDT) works with instructors in designing and implementing competency-based instruction, such as selecting or designing alternate modes, developing and selecting media, and evaluating learning. Little is said about the extent of the project except "We have some programs completely individualized."

The Blue Hills Regional Career Education Center (1973) developed a health services program using the analysis of job performances or occupational analysis (OA) as the curriculum base. Occupational analysis is then translated into performance objectives and finally sequenced into laboratory instruction units.

REPORTS ON RESEARCH

The problem of diverse entry competencies in a business calculations class was addressed by Swindle (1974). He divided a class in Business Calculations into two groups. He then separated a workbook-type text into fifteen sections. Students could take the quiz whenever they felt prepared. They were permitted to leave the class after passing fifteen quizzes. The range of time for completion was five to fifteen weeks. The other results reported by Swindle were as follows:

	Individualized Class	Traditional Control Class
Mean Test Scores	90.05	86.61
Media Test Scores	90.5	87.
Student Dropout	11.1%	13.9%

Other observations were that early exit was a strong motivation for some. The girl who worked intensively to be able to exit at five weeks was then able to get a job for the balance of the time. In general, students exhibited early frustration, then preference for the individualized mode. It was more work for the instructor, even with a student aide for correcting tests.

Blumhagen and Weber (1974) experimented with competency-based, individualized bookkeeping instruction, using illustrations, assignment sheets, study guides, and problem and unit tests. They identified the following advantages of the program:

1. By necessity it forces the student to become more self-reliant, to learn to set goals, to establish priorities, and to learn to listen to and to read directions and follow them.

2. It frees the instructor to be able to devote every class period to answering questions and to having periodic conferences with each student. The instructor becomes a "manager of learning" rather than the chief source of input.

3. In preparing a script, more thought and time go into it than often goes into the preparation of a chapter discussion (which too many times is given "cold" from previous years). The script, too, is consistent in providing all classes and all students with the same information, which all too often in multiple presentations may not happen.

4. With an individualized program, absences do not make any difference. Time spent helping students with make-up work is eliminated.

5. Many students show a marked change in their attitude toward work. Because the responsibility for getting the work done has been shifted to them, they accept it. More work is done outside of class than was ever done when the traditional approach was used.

Blumhagen and Weber also found some disadvantages:

1. The main disadvantage of the program, from the standpoint of the students, appears to be the boredom some students experience after having been subjected to this approach. By varying activities in the script and by interjecting projects and practice sets, this can be cut to some degree.

2. The possibility of students' relying too heavily on the answer book has been a concern to some observers of the program. However, if the students understand that their daily problems are done only to help them correctly do the problem tests, this, too, can be curbed. Also, the students should be taught to use the key as a learning device and not to copy answers blindly.

3. Keeping up with the checking of study guides and problem tests to determine whether the objectives have been met satisfactorily is a monumental task for the instructor. Unfortunately, a large part of the effectiveness of the program is dependent on this and the teacher who undertakes this method of teaching bookkeeping must accept and perform this task unstintingly.

4. The other major factor that can make the difference between a successful individualized program and a totally ineffective one is the instructor's ability to "keep a finger in the pie" in such a way that the students are aware of it. One very effective way of doing this is to schedule a weekly conference with each student, during which the instructor reviews the work the student has done throughout the past week; answers questions; goes over study guides and problem tests that the student has taken; and helps the student set up goals for the following week. Again, this takes a lot of time and record-keeping.

5. An individualized program not only takes a tremendous amount of time and effort to get it started, but it also demands the teacher's time, versatility, and patience to make it a successful experience for the student.

Blumhagen and Weber (1974) also found that the individualized program is definitely more effective than the traditional one for better students. Slow students are still slow, but are less frustrated. The unmotivated student has the most problems. When a basic program has been completed, several things which can enrich the program are:

1. When students cannot complete a problem test correctly the first time they take it, a kit of supplemental materials should be available.

2. Study guides of varying degrees of difficulty should be prepared.

3. More practice sets should be available that will represent the types of small businesses that many students are interested in, such as beauty shops, restaurants, and auto repair shops.

4. Projects that would supplement and/or enhance the text would be highly valuable and would enable students to pursue areas of interest in greater detail. These would include banking services, personal income tax, accounts receivable/accounts payable, account-keeping records for an organization, and keeping simple family or personal records.

5. A checklist of skills could be developed, and when a student masters a particular skill, a notation would be made. At the end of the course, an inventory of the capabilities of each student would be available.

6. A nine-week simulation geared to an accounting department could be invaluable to show the flow of records; to help students understand

not only how the records are maintained but also why they are necessary, and their value to management decision-making; and to develop interpersonal relations (a factor obviously missing in an individualized program).

7. Students who have jobs that involve bookkeeping tasks could be branched off into sequential learnings that might enable them to understand better their on-the-job work or that would lead to their being given additional bookkeeping responsibilities.

McClure (1973) developed learner-centered individualized materials as an alternative to traditional teaching methods in a welding program at the Kirkwood, Iowa, Community College. Students who enrolled in the fall quarter of 1971 became members of the experimental group. Students enrolled during the fall quarters of 1969 and 1970 became the control groups. The experimental group compared favorably to the control groups with respect to student time consumption, dropout rate, cost to institutions, and job procurement.

ACTIVITIES IN CBVE

Corbett and Davis (1974) identified the steps involved in setting up an individualized course using multimedia in secretarial science. They report as advantages that the program tends to focus on the student, is flexible, and easily updated.

Bro (1974) incorporated individualized units and competency-based instruction into a mechanical drafting course.

The need for a support system for disinterested and disadvantaged high school students is emphasized by Carbajal (1973). He prepared a system of individually prescribed education, including identification, diagnosis, prescription, and program modification, and found that additional support in the form of a student advocate was important.

In a Balance Sheet article, Kinzey (1973) tells of the necessity of writing office practice performance objectives with specificity.

Mt. San Jacinto Community College in California has accumulated eight years of experience in the development of individualized instruction for vocational education. At the college they combine individualized instruction, open enrollment, continuous progression, prescriptive education, mini courses, and a revised grading system to accommodate the competency-based system. Johnson and Schatz (1974)

report that in this program individualized instruction in vocational education is possible, practical, cost-effective, and, in today's conditions, necessary.

Whitaker (1974) found individualized instruction valuable in sales training in a private vocational school setting.

Calhoun (1974) describes three "levels" of individualization of vocational programs: (1) self-paced, (2) different routes, and (3) self-study.

Empirical research data on instruction in CBVE are lacking at present. The literature is largely devoted to descriptions of the development of objectives and of learning materials, most of which are still still not tested or validated. "Success" of a particular CBVE effort is usually based on what instructors saw, or thought they saw, in the classroom or laboratory.

Although much of the current output of literature on the various "things" associated with competency-based vocational education may not be research-based, and is widely divergent, it does represent to the profession the growing power and acceptance of the movement. The literature also says that instructors are generating more creative approaches to helping people learn, and are developing less rigid instructional systems. Nearly all types of CBVE programs require processes that collect and use performance data from students to improve student learning, and also to improve learning materials and instructor practices. Regardless of names or definitions used, this is good educational practice.

ASSESSING THE LEARNING EXPERIENCE

Assessing the learning experience has two parts. The first is assessment of individual performance. According to Pucel and Knaak, CBVE tests are criterion-referenced rather than norm-referenced. This means all students are required to meet prestated criteria. Pucel and Knaak (1975) refer to two types of assessment instruments: most objectives in the technical fields are evaluated with both knowing and doing assessment instruments. The doing assessment is designed to assess those things that you can observe a person doing. The knowing assessment is designed to assess those things that a person must know in order to perform competently. You cannot observe those things while a person is doing. They allow people to generalize their knowledge of 'how to' to those situations where the application of a particular task is appropriate.

Florida State University (1976) describes these tests: "Basically, criterion-referenced tests can be divided into two categories: written and performance. Written tests are more generally used to assess mastery in the knowledge area. A written test can be administered when the student is required to learn information such as definitions, facts, laws, etc. Performance tests require the student to perform a manual task. Performance tests should be used when the objective states, for example, that the student will be able to repair a carburetor or count out change. The instructor may be using a written checklist, but the student is required to demonstrate mastery of the objective through some method other than a formal written test."

CBVE programs require specialized progress reporting systems that are different from traditional group-centered programs. In the CBVE program, individual records must be kept of student mastery of many objectives.

Pucel and Cope (1973) describe a system for monitoring individualized student progress in individualized vocational programs. The design is intended to measure the effectiveness and efficiency of the programs, as well as monitor student progress. Validity tests for the system of evaluation were not available at the time of writing.

The Massachusetts Evaluation Service Center for Occupational Education (ESCOE) has published materials on performance test development for machine shop. An overview of this document has been written by Fortune (1972), who also describes organization of machine shop objectives around the desired performance outcomes.

Except for Carbajal's (1973) observations about the need for support services when CBVE is being used with the disadvantaged and disinterested, there is relatively little in the literature about the special problems that may be created with student motivation in a competency-based system of instruction.

Literature available on personalized instruction in higher education suggests that there may indeed be some problems inherent in competency-based individualized instruction. Hess (1974) discusses what seem to be the two most basic problems of the individualized system: excessive incompletes and procrastination. Hess suggests a number of procedures to alleviate the procrastination factor:

1. Use a cumulative record to plot student progress through the course.

2. Use an early, one-time contingency. Students must complete not less than one-fourth of the course in the first one-third of the time.

3. Contact persons falling more than one week behind the course "standard" pace.

4. Schedule the final exam at discrete times, that is, four weeks, one week, and two days before the end of the term.

Authorities generally agree that criterion-referenced testing as opposed to norm-referenced testing should be the general standard in CBVE. These criterion-referenced tests should be both written (for cognitive knowledge) and doing (for psychomotor performance skills).

The second part of assessing the learning experience is a general assessment of the overall effectiveness of the vocational instruction, often referred to as accountability.

Howsam and Houston (1972) describe accountability as public sharing of the objectives, criteria, means of assessment, and alternative activities. This is inclusive evaluation and may be more than most of the public want to know. The key point is that the information is available to all. The general public is interested in knowing: What is the educational program supposed to be doing? Is the program succeeding in doing this (and how do we know it is succeeding)? Is it succeeding at a reasonable cost?

The State of California recently passed the Hart Act, which mandates that school districts prepare lists of competencies and a means of assessing minimal competencies in secondary education. As a former teacher, Assemblyman Gary Hart, the bill's author, believes that the diploma as a device for certifying competence is almost meaningless. Possession of the diploma is no guarantee that the student has achieved basic skills in reading, writing, and computation (Association of California Administrators, 1977).

Spady (1977) has observed, "Overall, then, there is considerable evidence that states are jumping on a CBE-like bandwagon under the assumption that toughening certification standards for students will satisfy the public's need for school system accountability" (p. 9).

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATIONS

CONCEPT DEVELOPMENT

Interest and activity in competency-based vocational education (CBVE) is paralleling a national, accelerating trend toward competency-based education (CBE).

When minimum competencies are defined, there is a strong implication that nearly all students will achieve that level, and will demonstrate competence at that level before moving on to other instruction. This introduces the concept of mastery learning. Since students have different styles, aptitudes, and rates of learning, CBVE will require individualization of vocational instruction. Thus, CBVE, mastery learning, and individualized instruction are interrelated.

Recommendation: Vocational educators should recognize the interrelatedness of CBVE, mastery learning, and individualized instruction, and should develop instructional programs, learning materials, and progress reporting systems that embody all three concepts.

SPECIFICATION OF OBJECTIVES

CBVE objectives should be drawn from specific job tasks. The criterion standard to be written into the objective should be related to the skill and knowledge level required on the job. A trend toward state and regionalization of task statement development of task listings will minimize cost and effort of development at all local levels.

Student aptitude and ability to understand instruction must be considered in developing the criterion level of the objective. This has not received much attention in research or the literature.

The style and rhetoric of writing performance objectives for vocational education has had considerable attention in the literature. While there are some styling variations, most opinion indicates need for three component parts of the objective:

1. A statement of visible performance or behavior required.

2. A statement of the conditions under which mastery will be attained.

3. A description of the standard or criterion to be reached.

Recommendation: Vocational educators should use "banks" of task listings as a starting point for CBVE materials development. The tasks can be revalidated with a local advisory committee or workers in the occupation, but do serve as a reference point.

Standardization of the writing of performance criteria around the three components specified in this section would add clarity to research reports and the literature, and would also facilitate exchange of the objectives.

PROVIDING INSTRUCTION

Substantial attempts have been made to produce learning materials for CBVE, often generated as a combined effort of state departments of education and college or university systems. However, there is no extensive follow-up research indicating the impact on vocational instruction in terms of use by teachers in vocational programs.

A limited number of controlled CBVE research reports are available, but they indicate generally favorable results for CBVE in terms of number of students attaining mastery, level of test scores, and student attitude toward instruction. Students of all ability levels seem to benefit from CBVE. Low-motivated students who have difficulty organizing their time and work are a problem at all levels.

Many of the periodical descriptions of vocational education activity in CBVE are difficult to assess because of lack of agreement on terms and definitions of CBVE. Although CBVE presently lacks adequate definition for empirical research, its concepts have strong roots in education, the professions, and in American culture. For vocational education, it places increased emphasis on what vocationally trained graduates know and can do, as compared to the paper credentials issued so readily from the general and academic sector, on which society places less and less value. We also are getting closer to answering the question, "When is a typist, or programmer, or plumber, or instructor competent?" One would hope that the CBVE concepts will continue to draw strength and encouragement from the increasing volume of literature describing the increased activity in the field. Davies (1977) has pointed out that many factual and valid reports do not influence their readers to take any kind of action. He adds, "There is, however, also a literature of power, the function of which is to move . . .The objective is the 'understanding heart' and the strategy is

tacit. One of the greatest examples of this tacit domain is *Oliver Twist* by Charles Dickens. Amusing, inaccurate, it leaves an indelible impression on the heart. And this book, more than any other, was responsible for the changes in the employment of children in factories."

Similarly, the literature on instruction with competency-based vocational education, while lacking accurate descriptions, validity checks, completeness, and other usual tests, does have heart. In total impact, it describes the efforts of dedicated instructors who are finding ways to improve their practices and materials that help people learn.

Recommendation: The U.S. Office of Education should fund a project through the American Vocational Association or other well-recognized professional body to develop a dictionary of common definitions for CBVE. The enthusiasm for activity in the development of CBVE seems to be present, and a reasonably common language would be a giant step toward more valid research and dissemination of results of CBVE programs.

ASSESSING THE LEARNING EXPERIENCE

There is general acceptance of the need for criterion-referenced testing including both observed physical performance tests and knowledge tests. The minimum standard of performance required is correlated as much as possible with actual job requirements.

CBVE, along with CBE, is regarded by the general public as a response to demands for accountability in education. Immediate outcomes in vocational education typically lend themselves to definitive measurement more readily than general education outcomes. For example, if a graduating vocational education student can demonstrate skills and knowledge attainment in occupation training, obtain a job in that field, hold it for a year, make progress, and receive a favorable supervisory report, one can make judgments that the training was successful. If the same pattern is consistently true for most students exiting from that vocational program, the program may be judged successful.

PRIORITIES FOR RESEARCH

There are two general categories of research that need attention. The first is research emanating from discoveries of gaps in previous

research studies. The second is drawn from national and local societal needs and trends which appear to be unmet due to their absence from literature and published research.

SPECIFICATION OF LEARNER OBJECTIVES

Only minor attention has been given to two aspects of learner objectives. The first is how the "mastery" or "passing" level of an objective is to be derived. These are references to the level required by the job for which the student is trained, but does it mean job entry level? Or, does it mean at an advanced skill level?

The second unmet research need is what is to be assumed about the aptitudes of the learners. The individualized, mastery learning concepts possible in CBVE enable a course designer to prepare for a broader aptitude range of students. However, for a given vocational program, there still needs to be a defined range of aptitude. Ways of defining that aptitude range are not well developed. This has strong implications for vocational education for the handicapped and disadvantaged.

PROVIDING INSTRUCTION

A considerable volume of competency-based instructional material has been generated by state departments of education, by teacher training universities, and by local school personnel. There is little evidence how many teachers use this material, to what extent, and how.

Also, unlike the development of objectives where there is general agreement on basic format, there is little agreement on just what constitutes competency-based vocational learning materials. Research is needed on effectiveness of both systems of providing CBVE, and on the effectiveness of specific learning materials.

ASSESSING THE LEARNING EXPERIENCE

Development of testing instruments for CBVE for both knowledge and performance is not unlike the development process for traditional group-centered work. The difference is in the individual administration of the tests, and the necessity for individualized recordkeeping.

A unique requirement of CBVE--that of having multiple test items available for one competency--has not been adequately addressed in research or the literature. Multiple test items are necessary because

students who do not pass a competency test are required to repeat it, and may remember part or all of the first test.

Description of new and unique systems of recording and reporting mastery of competencies is also missing from the literature, as are overall systems for evaluating CBVE. Questions needing answers include:

1. What is the impact of CBVE on the admission and successful training of the handicapped and disadvantaged?
2. What is the impact of CBVE on dropouts?
3. Are there special variable techniques within CBVE that impact learning substantially?
4. What is the cost benefit of CBVE in a variable time structure?
5. What is the cost benefit of CBVE in a fixed time structure?
6. What is the optimum fixed performance level to train for in a CBVE system?

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APPENDIX A

SELECTED ADDITIONAL READINGS

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